CHAPTER 3

Digital Fluency in SMEs: A Typology and a Multi-Case Study

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ABSTRACT

In the practitioner and the academic literatures, links between information technology (IT) adoption, IT use and digital fluency (DF) have been emphasized by a number of authors. However, there is a lack of understanding of what exactly digital fluency is, how it can be conceptualized and what role it plays in small and medium-sized enterprises (SMEs). Based on the DF literature and its underlying concepts such as skills, expertise and competencies, as well as on the SME literature, a multi-case study of three Canadian SMEs is conducted to empirically evaluate a typology of DF archetypes. The typology, that is based on a change agent perspective, has three archetypes. Results suggest that SMEs' managers should focus on the complementarity nature of the cognitive, social, and technological dimensions of DF when assessing and developing their employees' DF.

INTRODUCTION

In today's world, private and public, small and large, manufacturing and service organizations have to develop and deploy strategies and processes that rely on information technologies (IT) (Catlin, LaBerge, & Varney, 2018). These organizations are overwhelmed by torrents of data and, to stay competitive or simply to survive, they have to manage those data and make sense of it (Dallemule & Davenport, 2017). This adds to the challenges related to the rapid and constant technological evolutions that organizations and their employees must face. In fact, the pressure is mainly felt by employees who must keep up the pace with the technological changes (Colbert, Yee, & George, 2016). They must make sure to maintain the appropriate knowledge, skills, abilities, and attitudes towards the various IT they have to use in their daily work. Thus, they have to stay digitally fluent (Hsi, 2007; Briggs & Makice, 2012). Maintaining

the proper level of digital fluency (DF) can be challenging for any organization but even more for small and medium-sized enterprises (SMEs) (Kyobe, Namirembe, & Shongwe, 2015; Lehner, 2018; Soto-Acosta, Popa, & Martinez-Conesa, 2018).

To stay competitive, SMEs need to innovate with IT and to develop new business strategies as well as processes that rely on IT (Kim, Jang, & Yang, 2016; Nguyen, Mewby, & Macaulay, 2015; Verbano & Crema, 2016). Thus, SMEs need to invest in IT infrastructures. However, the gains and benefits of such investments will materialize only if employees adopt and use IT adequately, which, in turn, depend on employees possessing the appropriate competences to maximize their use (Kotey & Folker, 2007; Palacios-Marqués, Soto-Acosta, & Merigó, 2015; Peltier, Zhao, & Schibrowsky, 2012). Moreover, SMEs have more limited means than larger organizations in terms of financial and human resources which will affect their capabilities and readiness to face the challenges imposed by constant IT evolutions strategies (P. Cragg, Mills, & Suraweera, 2013; Verbano & Crema, 2016). Therefore, it is essential that employees have a better understanding of the challenges and the opportunities related to the adoption and use of new IT in their daily works if SMEs want to benefit from their IT investments. Thus, SME employees must have the right digital competence or digital fluency to transform these IT investments in organizational value (Briggs & Makice, 2012; Caldeira & Ward, 2002; Colbert et al., 2016).

Aligning organizational strategies with existing IT expertise directly affect the extent of the adoption and use of IT in an SME (Bharadwaj & Soni, 2007; Fillis & Wagner, 2005; Marsh, 2018). Most SMEs find themselves in a difficult position because, on one hand, they must ensure that their IT strategies keep up with the constant and rapid technological evolutions and, on the other hand, they must ensure that their employees have the adequate DF to properly adopt and use these IT (Bergeron, Croteau, Uwizeyemungu, & Raymond, 2017; Dallemule & Davenport, 2017). From this discussion an important question emerges: How do SMEs' managers determine the actual level of DF of their employees and what would be the level of DF these employees need to attain?

Fluency is a concept that represents different things to different people in different contexts. The Merriam-Webster Dictionary (2018) defines it as " the quality or state of being fluent" and fluent as "having or showing mastery of a subject or skill". Such general definitions may explain why fluency has been conceptualized as an umbrella-type of notion wrapping almost every attribute that might influence performance (Bassellier, Horner, & Benbasat, 2001). In relation to information technology the concept of fluency has been labelled as digital fluency (DF). Briggs and Makice (2012) define it as "the maximum potential an individual has to achieve desired outcomes through the use of digital technology. Fluency is the results of individuals continuing to maintain and improve skills relative to the needs of your organizational context. Your fluency helps you act in a way that anticipates and support change (p.13)". For these authors, the skills and abilities related to the use of IT and the understanding of its roles in an organizational context are the central elements of DF. For Savin-Baden (2015), DF is "the ability to use digital media, of whatever sort, to manage knowledge and learning across diverse offline and online spaces. It includes the ability to understand complex issues, such as how identify can be established and faked, the ability to evaluate the trustworthiness and accuracy of information, and the ability to understand the subtext of digital media and information and place within a wider context (p.140-141)". Hsi (2007) provides a conceptualization of DF which overlaps with the knowledge, skills and attitudes to properly use IT in today's digital economy, since she defines it as "the competencies, new representational practices, design sensibilities, ownership, and strategic expertise that a learner gains or demonstrates by using digital tools to gather, design, evaluate, critique, synthesize, and develop digital media artefacts, communication messages, or other electronic expressions (p.1509)". Thus, being digitally fluent covers not only the technical skills element required for an employee to work in today's organizations but also the contextual/social and the cognitive and socio-emotional elements (Ala-Mutka, 2011; Briggs & Makice, 2012).

To be digitally fluent in today's digital economy, employees needs to have the proper skills, knowledge, attitude and awareness needed to perform, through the use of digital media and IT, various tasks such as problem-solving, communicating, collaborating, coordinating, creating, innovating and managing information, learning and socializing (Ala-Mutka, 2011; Briggs & Makice, 2012; Ferrari, 2012). Besides the technical expertise, DF emphasizes the importance of taking into consideration the social and contextual dimensions such as the cognitive and socio-emotional knowledge, skills and attitude towards IT (Ala-Mutka, 2011; Briggs & Makice, 2012; Hsi, 2007).

Various studies that have studied IT skills, competencies and/or digital fluency in SMEs suggest that the various levels of organizational DF are related to different levels of accumulated individual IT skills and knowledge in the organization. Studies have shown that the combination of the top management attitude and knowledge regarding IT, with the internal development of IT skills engendered higher levels of success with IT use in SMEs (Dibrell, Davis, & Craig, 2008). During the last two decades, most of the studies that have assessed the digital competency and/or fluency took a more "technical" perspective (Marcolin, Compeau, Munro, & Huff, 2000) and have focused on identifying: 1) IT professionals' personality characteristics (Bashein & Markus, 1997), 2) IT specialists knowledge and skill (Seppanen, 2002); or 3) business managers' technical skills (Bassellier et al., 2001). Although interesting and informative, most of these studies have adopted a limited conceptualization of the IT use and do not take into consideration other key dimensions of DF, such as the social environment sensibility and the cognitive capabilities related to the effective adoption and use of IT. Such narrow perspective is not wrong, but by putting most emphasis on the technological aspects of IT use, it might be too restrictive to be applied in the context of the today's digital economy (Burton-Jones & Grange, 2013).

The various conceptualizations and definitions of IT skills and digital fluency share one commonality, most of them have a multidimensional structure. While some conceptualizations focus on the technical and practical dimensions of IT use (Marcolin et al., 2000), others highlight the importance of conceptualizing and developing DF by encompassing the acquisition of higher order thinking skills that can be used in various contexts (Briggs & Makice, 2012; Calvani, Cartelli, Fini, & Ranieri, 2008; Ferrari, 2012). Indeed, IT are now ubiquitous and their use now spreads across various industries and organizations' levels. IT can be used to accomplish a large array of various tasks. Nevertheless, Lamb and Kling (2003) suggest the expansion of the concept of IT users, i.e. the active agents who use the IT. For these scholars, the concept of IT user should be more encompassing since IT users are, above all, social actors who are "simultaneously enabled and constrained by the socio-technical affiliations and environments of the firm, its members, and its industry" (Lamb & Kling, 2003, p.218). Thus, in the context of SMEs, this reconceptualization of the IT user means that, since each of them has to play different roles (Lamb & Kling, 2003), each of them have also a share of responsibility regarding the forecasting, the development and/or the implementation of IT in their company (Bruque & Moyano, 2007). Thus, each SME employee can be viewed as an agent of organizational change (Markus & Benjamin, 1996).

The literature on DF and all its underlying concepts such as competency, skills, expertise, knowledge, etc. reveals a myriad of various conceptualizations of DF that creates some confusions regarding what DF is. Thus, the DF conceptualization is fuzzy and falls short of providing the clarity needed by scholars and managers alike to understand the multidimensional nature of this concept. In addition, the SME's literature does not offer a clear perspective on the role played by DF in generating IT-based business value.

Taking into consideration this gap in the literature, our intention is to develop a conceptualization of DF which is more encompassing. More precisely, our goal is to address the following research questions:

1*) How can digital fluency (DF) be conceptualized? 2) Do different types of DF exist in the context of SMEs? and 3) If so, how can they be characterized?*

To do so, we propose a DF typology that builds on the existing body of research on SMEs, on the change agent perspective, and on the various DF definitions and conceptualization of DF and its underlying concepts. The DF conceptualization we are proposing is based on three key competence domains, i.e., technological, cognitive and social along with their learning areas, i.e. skill (know-how), knowledge (know-what) and attitude (know-why) are assembled in a theoretical framework. Our goal is to theorize on how combinations of these key competences domains and learning areas will impact IT adoption and use in SMEs. We suggest that these combinations represent DF archetypes of SMEs' employees and represent the building blocks of our proposed typology. Three different case studies of Canadian SMEs are studied to empirically test these archetypes.

Thus, this study provides "an explanation of how, why, and when things happened, relying on varying views of causality and methods for argumentation" (Gregor, 2006, p.619) and proposes a theoretical tool that enables readers to develop a broad understanding of a typology of DF in the SME context. As we pursue a theory-building approach, we put "less emphasis on the synthesis of prior literature and more emphasis on theoretical development" (Rivard, 2014, p.iv).

THEORETICAL FOUNDATIONS

Digital Fluency Conceptualization

In today' digital economy, technology is ubiquitous and plays a central role in organizations especially in SMEs (Catlin et al., 2018; Lehner, 2018; van Laar, van Deursen, van Dijk, & de Haan, 2018). To survive and navigate in this digital economy, employees have to be digitally fluent which means that they should not only know how to use digital technology but also know "how to construct ideas of significance with digital technology" (R. Wang, Wiesemes, & Gibbons, 2012, p.571). For Wang et al. (2012), digital fluency represents "the ability to reformulate knowledge to express oneself creatively and appropriately, and to produce and generate information rather than simply to comprehend it (p.2)". This definition also highlights the fact that individuals need to know not only how to use the technology but also how produce, in a specific context, things of significance with the technology. Such conceptualization goes beyond the concept of digital literacy (Ferrari, 2012). Indeed, Ala-Mutka (2011) posits that digital fluency "emphasize and encompass the need for skills, an understanding of concepts and an intellectual capability for abstract thinking about information (p.23)". For Miller and Bartlett (2012) the notion of competency and knowledge are central to the notion of digital fluency which they define "as the body of competencies and knowledge necessary to critically engage with online content […as] a source of information that influences many consequential, even life-changing decisions (p.36)". Thus, to be digitally fluent, individuals must have the proper digital competences since " digital fluency would mean being fluent in digital competence (Ala-Mutka, 2011, p.36).

In an organizational context, different competences encompass the various skills, complementary assets, and routines used by employees to generate sustainable competitive advantage (Selznick, 1957). Thus, an organizational digital competence contains the technical skills and expertise available. Moreover, since organizational digital competence represents a combination of individuals' competences, digital competence has been mainly studied at the individual level (Pavlou & El Sawy, 2006).

In the literature, a positive correlation has been established between an organization's level of accumulated knowledge on IT innovations and its level of IT use. At the organizational level, most past studies have focused on IT management competences (e.g. Pavlou & El Sawy, 2006), while at the individual level (e.g. Bassellier & Benbasat, 2004; Bassellier et al., 2001), the focus has been on specific IT competences of managers and IS professionals. At the organizational

level, Pavlou and El Sawy (2006) have proposed a general and encompassing definition of IT competence which is "…the extent to which a firm is knowledgeable about and effectively utilizes IT tools to manage information within the firm… (p.204)". However, such general and encompassing definition does not seems to find an equivalent at the individual level. Rather, scholars and practitioners have developed a wide variety of definitions and conceptualization for specific contexts. Such situation engenders some difficulties and confusion when one tries to compare and integrate research findings, to explain in a unified definition what DF exactly is and how one should integrate and compare its imbricated dimensions.

One way to conceptualize and define digital fluency is to take into consideration its underlying learning domains: i.e. knowledge, skills, and attitudes (e.g. Bassellier et al., 2001; Harisson & Boonstra, 2009; Hsi, 2007). As highlighted by several scholars, DF is sensitive to the organizational context (Briggs & Makice, 2012; Hsi, 2007; Miller & Bartlett, 2012). Thus, a conceptualization of DF should identify the main competence domains and the main learning areas associated with the specificities of a particular context. For this reason, we think that it would not be appropriate and relevant to propose a unique set of DF that could be used and applied in all the possible organizational contexts since each context is characterized by idiosyncratic practices, norms, and values. Therefore, we posit that at the conceptual level, the DF has to be constant throughout the various contexts while, at the operationalized level, the DF has to be adapted and revised to be representative of the organizations' context studied as well as aligned with the idiosyncratic social practices and technological environment (Doty & Glick, 1994). So, DF can be conceived as a multidimensional concept that encompasses the necessary set of knowledge, skills, and attitudes that an individual possess in order to evolve in a specific technological context. In other words, IT must be appropriated by social actors that engage in the role of change agent (Burton-Jones & Grange, 2013). Based on the above argumentation, we propose the following conceptualization of individual DF:

Digital fluency is an individual capacity to use and combine one's knowledge (i.e., know-what), skill (i.e. know-how), and attitude (i.e. know-why), which represent the learning areas, associated with three related competence domains, i.e. technological, cognitive and social, to use new or existing IT to analyze, select and critically evaluate information in order to investigate and solve work-related problems and develop a collaborative knowledge base while engaging in organizational practices within a specific organizational context.

Figure 1 provides an illustration of the DF multidimensional conceptualization. The central idea of our approach is that the competence domains as well as the learning areas are simultaneously coexisting and complementary to one another.

Technological domain - The knowledge, skills and attitudes that individuals need to possess to explore and exploit IT in a new environment as well as to apprehend the technological challenges or problems with agility are underlying the technological domain (Calvani et al., 2008). Examples of challenges or problems associated with this domain could be, for instance, choosing the most appropriate IT for certain tasks, solving organizational problems using IT, recognizing and using icons and interfaces of particular IT (Ferrari, 2012). The knowledge related to IT infrastructure, such as computers, applications, networks, etc. would be examples of technological knowledge (International ICT Literacy Panel, 2007). The individuals aptitudes regarding the use of specialized tools supporting business tasks or applications for executing the technical operation aspects of digital tools would be examples of technological skills (Ala-Mutka, 2011).

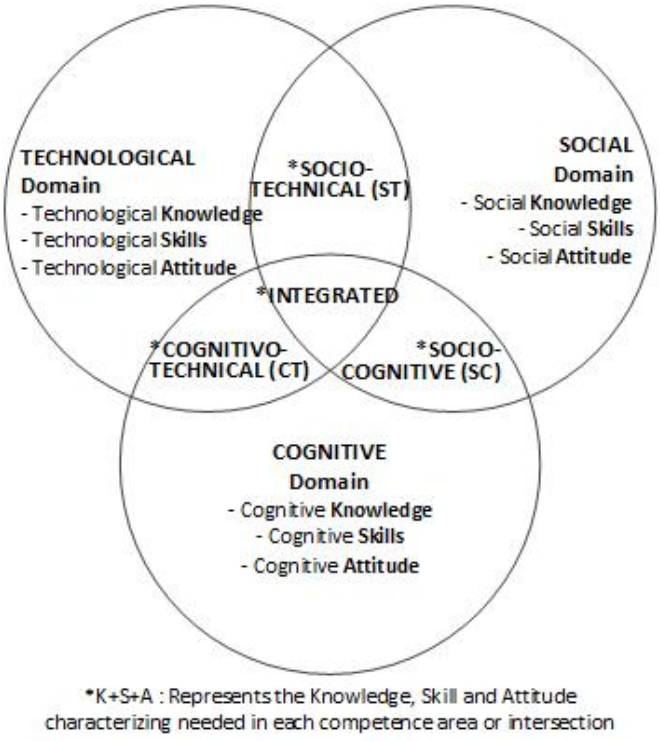

Figure 1. A multidimensional Conceptualization of Individual Digital Fluency

Cognitive domain - The knowledge, skills and attitudes that individuals need to possess to "read, select, interpret and evaluate data and information taking into account their pertinence and reliability" are underlying the cognitive domain (Calvani et al., 2008, p.187). Accessing, organizing and/or evaluating information are related to the cognitive domain. It includes "tasks on linguistic and numeric competences applied to the digital word" (Ferrari, 2012, p.56), reading and interpreting texts, making sense of data, assessing information, creating graphs (Calvani et al., 2008). Example of cognitive skills include "general literacy, … as well as critical thinking and problem solving" (International ICT Literacy Panel, 2007, p.1).

Social domain - The knowledge, skills and attitudes that individuals need to collaborate with colleagues or partners by using various IT platforms and functionalities while following the organizational work norms and values (Calvani et al., 2008). Thus, examples of social skills include "effectively express and communicate, understanding the potential and limitations of each type of media … collaboration with possibly global reach, construct and maintain a system of personal communication links with relevant people and networks, … participate in digital activities…", etc. (Ala-Mutka, 2011, p.51).

Integrated domain - The integrated domain encompasses the knowledge, skills and attitudes of the three domains and focuses on their complementarities. It includes the knowledge, skills and attitudes needed for adopting and using IT for supporting and enhancing organizational practices as well as for collaborating with colleagues and partners, both internal and external, to generate value and innovate. In the integrated domain, it is essential that individuals understand "the potential offered by technologies which enable individuals to share information and collaboratively build new knowledge" (Ferrari, 2012, p.55).

An Integrative View of Digital Fluency

The literature on digital fluency several conceptualizations and definitions of the learning domains, i.e. knowledge, skills and attitude, have been proposed. This situation has engendered some confusion regarding the interpretations and the meaning each of these concepts. In order to clarify these concepts, we have decided to build our multidimensional conceptualization of DF on preexisting and relevant definitions that have been used in the context of DF (Table 1).

Areas	Definition	Source
Knowledge	Facts, information, principles, theories and practices acquired through experience and/or education, i.e. the theoretical or practical understanding of the nature, role and opportunities of IT in everyday contexts such as, for example, using computer applications, understanding of the opportunities and potential risks of Internet and social media, information sharing and collaborative networking, etc.	(Ala-Mutka, 2011; Genevieve Bassellier et al., 2001; Merriam-Webster, 2018; Soto-Acosta et al., 2018)
Skills	The ability to apply knowledge to complete tasks; to solve problems; to search, collect and process complex information and; to produce, present and understand it, using IT, in a critical and systematic way.	(Ala-Mutka, 2011; Marcolin et al., 2000; Merriam-Webster, 2018; van Laar, van Deursen, van Dijk, & de Haan, 2017; van Laar et al., 2018)
Attitude	The ways of thinking and the motivations for acting that shape people's action in digital environments such as intercultural, collaborative, critical, creative, responsible and autonomous aspects. For example, they include ethics, values, and priorities.	(Ala-Mutka, 2011; Ferrari, 2012; Merriam-Webster, 2018; R. Wang et al., 2012)

Table 1. Digital Fluency: Definitions of the Learning Areas

In a study commissioned by the European Commission Joint Research Centre Institute for Prospective Technological Studies, Ferrari (2012) suggests that the competencies underlying DF are much more encompassing than the technical skills usually associated with DF. She proposes a list of seven application domains that employees and individuals need to master to face the challenges of the digital economy. These application domains along with the domains underlying the DF conceptualization are presented in Table 2.

Digital Fluency Archetypes of SMEs' Employees

The competence domains, i.e. cognitive, social and technological and the three learning areas, i.e. knowledge, skills and attitudes are complementary to one another and could be combined in different ways in the proposed DF conceptualization. Each specific combination can describe a particular archetype (Doty & Glick, 1994). In order to combined the competencies domains and the learning areas together to identify DF archetypes, we use the change agent perspective if we consider that SMEs' employees are potential change agents (Lamb & Kling, 2003; Markus & Benjamin, 1996). This perspective is more encompassing and less limited and restrictive than user perspective adopted in previous studies (e.g. Marcolin et al., 2000). The DF conceptualization (Figure 1 and Table 1) will be used as a basis for developing the typology of SME employees DF archetypes (Doty & Glick, 1994; George & Bennett, 2005). Typologies and typological theories allow to explore a complex organizational phenomenon such as DF archetypes or profiles as well as their possible effects on IT use and IT adoption (George & Bennett, 2005). In typology, different ideal types or archetypes that are "… complex constructs that can be used to represent holistic configurations of multiple unidimensional constructs" (Doty & Glick, 1994, p.233) are developed and are posited to be maximally effective specific contexts. Typologies can be used to develop typological theories which adopt encompassing perspective as

they take into consideration the holistic principles of inquiry and equifinality (i.e., the same outcome being attained via different pathways). In addition, such theories address complex phenomena without oversimplifying them, and identify the pathways connecting particular archetypes to specific outcomes, such as IT adoption and use (George & Bennett, 2005).

Domains of application	Digital Fluency domains (Figure 1)	Description
Individual domains		
1. Creation of content and knowledge	Cognitive domain	Construction of new knowledge through technology and media. Integrate previous knowledge; construct new knowledge.
2. Collaboration	Social domain	Link to others, participate in online networks and communities, and interact constructively and with a sense of responsibility.
3. Technical Operations	Technological domain	Use technology and media, perform tasks through digital tools.
Overlapping domains		
4. Ethics and responsibility	Intersection of Social and Cognitive domains	Behave in an ethical and responsible way, aware of legal frame.
5. Information Management	Intersection of Technological and Cognitive domains	Identify, locate, access, retrieve, store and organize information.
6. Communication and sharing	Intersection of Technological and Social domains	Communicate through online tools, considering privacy, safety and netiquette.
Integrated domain		
7. Evaluation and problem solving	Technological, Cognitive and Social domains	Identify digital needs, solve problems through digital means, and assess the information retrieved.

Table 2. An integrative view of Digital Fluency (adapted from (Ferrari, 2012; Harison & Boonstra, 2009))

We draw on the change agentry perspective by considering SMEs' employees as change agents to identify DF archetypes. In order to change, organizations must use three different but complementary types of strategies that could be deployed by change agents: 1) political, 2) marketing, and/or 3) military campaigns (Hirschhorn, 2002). Thus, for getting support and creating a strong coalition for change, change agents should lead a political campaign. For communicating the objectives, the benefits, and the roadmap to change, as well as for getting engagement from the organization and the employees, a marketing campaign should be deployed. Finally, for identifying and securing the scarce resources needed for the change to materialize, a military campaign should be launch.

In a similar fashion, Markus and Benjamin (1996) develop three archetypes of change agents that can lead the changes efforts: traditional, facilitator, and advocate. For each archetype Markus and Benjamin (1996) identify dominant beliefs underlying a archetype's behaviors which provides "a basic orientation toward goals and means of IS work that shapes what the practitioner does and how she or he does it" (Markus & Benjamin, 1996, p.387). The three archetypes are not empirical classes or categories of a taxonomy but rather theoretical constructions of complementary characteristics that could help characterizing the DF archetypes of SMEs' employees regarding the adoption and use of IT (Harison & Boonstra, 2009; Markus & Benjamin, 1996). Hirschheim and Klein (1989) have also identified four dominant patterns or archetypes of IS specialists. The four developed archetypes, the expert, the facilitator, the social warrior, and the emancipator, describe the underlying assumptions of each archetype.

Archetypes	Technical Expert	Organizer	Campaigner
Key characteristics	1. Focuses on technical expertise; 2. Detached from stakeholders' objectives; 3. Responsible for technical aspects only; 4. Works with minimal contact from stakeholders.	1. Focuses on stakeholders' support; 2. Serves stakeholders' objectives; 3. Helps stakeholders increase their capacity for change and autonomy; 4. Provides learning advice; 5. Is responsible of changing the stakeholder's behaviors; 6. Instructs stakeholders in making informed decisions; 7. Tries to gain consensus; 8. Is organized and flexible.	1. Uses tactics (e.g. persuasion, manipulations, power) to attain his objective; 2. Responsible for attaining change objectives; 3. Makes decisions to guide the change effort in a particular direction; 4. Focuses on objectives. 5. Is well organized, and focuses on objectives.
Conceptualizations Identified in the change agent literature	• Traditional model (Markus & Benjamin, 1996) • Expert type (Hirschheim & Klein, 1989)	• Facilitator model (Markus & Benjamin, 1996) • Facilitator archetype (Hirschheim & Klein, 1989) • Political/marketing campaigns (Hirschhorn, 2002)	• Advocate model (Markus & Benjamin, 1996) • Social warrior archetype (Hirschheim & Klein, 1989) • Military campaign (Hirschhorn, 2002)

Table 3. Digital Fluency Archetypes of SMEs Employees

Based on the various archetypes descriptions developed by change agent scholars (Hirschheim & Klein, 1989; Hirschhorn, 2002; Markus & Benjamin, 1996) and the specificities of SMEs (Bergeron et al., 2017; Lehner, 2018; Verbano & Crema, 2016), we propose three DF archetypes of SMEs' employees: 1) Technical Expert, 2) Organizer and 3) Campaigner (see Table 3). We posit that the "technical expert" archetype would predominantly be related to the technological domain rather than the social or cognitive ones. However, this situation does not mean that the "technical expert" archetypes has no cognitive and/or social knowledge, skill and attitude. Rather, this means that, for a technical expert, his/her predominant knowledge, skills and attitude would be associated with the technical domain rather than with the cognitive and social domains. This situation also prevails for both the "organizer" and the "campaigner" archetypes. Table 3 presents the overlapping characteristics of the archetypes identified in the literature.

Table 3 provides interesting descriptions of DF archetypes, notwithstanding somewhat general and simplistic and not providing a broad conceptual perspective of the DF underlying each change agent type. These archetypes will serve as a theoretical base to build a typology of DF in an SME context. While theoretically developing DF archetypes is intuitively appealing, their inherent lack of specificity also makes them difficult to be empirically tested. So, as a first attempt to characterize the DF archetypes while considering the specificities of SMEs, the present study is an initial effort in that direction. The proposed DF conceptualization (Figure 1) will serve as a "property space" to guide the identification of empirical DF archetypes of SME employees (George & Bennett, 2005).

METHODOLOGY

In order to empirically evaluate the typology of DF archetypes, a qualitative research approach was adopted (Eisenhardt, 1989). More specifically a multi-case study (Yin, 2013) of three Canadian SMEs was conducted since to capture the perceptions and understandings of SMEs stakeholders' regarding the role of DF as well as to evaluate the importance of implementing new IT in the context of the digital economy. Since the literature on DF is fragmented, adopting a qualitative exploratory approach allowed us to make both empirical and theoretical contributions. Our goal was to identify and better understand the characteristics and factors that can affect the development of the DF in SMEs. Based on perceptions of experienced SME employees we were be able to identify the similarities and specificities in each of the three organizational contexts regarding how DF were developed. Relying on perceptions is an appropriate approach since we were trying to develop a theory that focuses on a "how question", i.e. how key competencies domains and learning areas can be combined and affect IT adoption and use in SMEs. Thus, a field study using case studies helped us to define the appropriate research design and data collection method but it also served as the main vehicle for generalizing the results of the case study (Yin, 2013).

The data collection was conducted in three Canadian SMEs (Castlehouse, Woolhouse & Synthouse – no real names), from the clothing industry. These companies were conducting IT implementation projects at the time of the data collection. For each project, employees of these SMEs had to adopt and use new IT in their daily tasks. To help them better use the new technologies and promote the benefits of the IT investment, each employee received a training, ranging from half a day to two days. Data were collected over a five-month period in 2015 though interviews and observations. Between five to nine employees were interviewed before and after the training and use of the new IT in each SME. Owners of the SMEs as well as managers (HR and IT), and representative employees were interviewed. Semi-structured interviews were conducted by at least two researchers each time. The interviews' objectives were to better understand/identify:

- How IT were evaluated in the SMEs,
- The role played by IT and how IT were used on a daily basis,
- Which knowledge, skills and attitude were needed for using IT in the SMEs,
- The various profiles of typical IT user in the SME,
- The characteristics of the IT infrastructure and the SME's context,
- The extent of organizational IT readiness and use,
- The employees' level of support and confidence in the IT-triggered change.

The interview questions were developed based on the competence domains and the learnings areas of the DF conceptualization (Figure 1 and Table 2) as well as on questions developed by other researchers (Cragg, Caldeira, & Ward, 2011; Harison & Boonstra, 2009).

The data collected was used to: 1) Evaluate the relevance and usefulness of the DF conceptualization, 2) Identify the characteristics, in terms of competence domains and learning areas, of the DF archetypes of SME employees, and 3) Understand the possible effects of these archetypes on IT adoption and use. Since we conducted an exploratory study of a complex phenomenon - digital fluency -, we focused our analysis on the dynamics within cases and across cases in order to build a DF typology from case studies (Eisenhardt, 1989; Yin, 2013). This theory building approach is suited for studies where a priori constructs are triangulated by multiple case studies and where within-case and cross-case analyses are combined with the literature (Eisenhardt, 1989). During the five month of data, data analyses were conducted in parallel to make adjustment during the data collection (Yin, 2013).

Cases descriptions and analysis

Case study 1: Castlehouse

The first case study was conduct in Castlehouse a manufacturing and retail clothing SME of 350 employees. Castlehouse operates in a segment of the industry characterized by important pressure coming from Asian competitors as well as by and constant new demands and changes. At the time of the data collection, Castlehouse had recently deployed a new manufacturing IT platform (Lectra) to automate its sewing machines. The managers of Castlehouse were preoccupied by the implementation of this new technology and they wanted to better understand and identify the types of DF that their employees would need to develop to ensure a smooth and easy transition from the legacy technology to the new IT. In total, six employees from Castlehouse were interviewed: three managers from production, IT, and HR and three sewing workers – pattern technicians. Based on the analysis of the data collected at Castlehouse, two different DF archetypes seems to exist in this SME: the technical expert and the campaigner. In terms of competence domains and learning areas covered by those two archetypes, the technical expert at Castlehouse seems to mainly possess knowledge, skills and attitude related to the technological domain, whereas the campaigner seems to possess knowledge, skills and attitude related to both the social domain and the socio-technical intersection (see Figure 1).

At Castlehouse, it seems that the campaigner archetype is strongly embodied by the production manager. The data suggest that this person relies on both her technological and social relational skills and knowledge to promote the new manufacturing IT platform (Lectra) to both executives and floor employees. Since she has a good understanding of the technological functionalities of the new IT platform and having developed good social relations with everyone in the organization, she explained to all employees how the new IT platform would support Castlehouse's development strategy to increase its competitiveness. Thus, she played a key role in supporting and helping floor employees who would have to use, on a daily basis, this new platform:

> *Provide the proper working tools. Evaluate the needs. Identify who can address the needs. Send him/ her to training. Some already had the training: you just have to find the right job position for them. Find the right time to move the employee to a new job position or get him/her to change his work practices. (Production manager)*

The technical expert archetype was embodied by the pattern technicians. Our data analysis shows that the pattern technicians were mainly preoccupied by the technical expertise needed to master the new IT platform. In addition, they turned to colleagues to collaborate with them in order to get support, have access to new knowledge and develop their technical skills regarding Lectra. However, this collaboration is rather limited to exchanging information on how to use the system:

> *Once a new technology has been introduced, we get training. And then, after most of the people get trained, the ones that are more competent will be able to train some other employees […] As soon as we discover something we will share it. We would say: 'oh look, I found a new function; it works like that, what you think about it?' Then, we will share it among us. (Pattern technician)*

Based on the data collected, the Campaigner archetype at Castlehouse seems to be characterized by strong social skills and attitude as well as by technological knowledge. As for the Technical expert archetypes, it seems to be mainly characterized by the knowledge, skills and attitude related to the technological domain.

Data analysis suggests that DF archetypes at Castlehouse are mainly characterized by a mix of technological and social domains knowledge, skills and attitude. Thus, since the IT manufacturing platform is used by the patterns technicians and by the production manager to solve organizational problems and nurture organizational goals, we conjecture that the inclusion of the cognitive1 domain of the DF (see Figure 1) is also a key factor for a successful adoption of the new IT.

Case study 2: Woolhouse

The second case study was conducted in Woolhouse, a 40 employee family-owned company specialized in knitting. This SME operates in the field of clothing wholesale distribution and manufacturing. Their products, which are made of special fabrics coming from Egypt and Italy, are designed in Canada and have been manufactured for more than 30 years in Woolhouse's owned workshops in China. In 2014, an important strategic and operational move was made by Woolhouse by launching an online store. The underlying objective of this strategic decision was to reach new markets and grow. However, to be able to support this online store Woolhouse had to deploy a new customer relationship management (CRM) system that would affect Woolhouse's operations and value chain. Nine employees at Woolhouse were interviewed including the owner.

Data analysis suggests that three different DF archetypes exist in this SME: the technical expert, the campaigner and the organizer. In terms of competence domains and learning areas covered by those three archetypes, the technical expert at Woolhouse seems to mainly possess knowledge, skills and attitude related to the technological domain. As for the campaigner, it seems to possess, just like the campaigner at Castlehouse, the knowledge, skills, and attitude related to both the social domain and the socio-technical intersection. Finally, the characteristics of the organizer archetype at Woolhouse are idiosyncratic and characterized by the possession of knowledge, skills, and attitude related to socio-technical, socio-cognitive, and the cognitive-technical intersections as well as to the integrated intersection (see Figure 1).

At Woolhouse the warehouse clerk played a key role in operation since he was the person with the best understanding of Woolhouse's business processes. He also had very strong technological background and was interested in technological evolutions. He had self-learned the IT infrastructures of Woolhouse and, with his understanding of the organization processes, made useful improvements in the systems. He became the de-facto IT 'expert' and our data analysis suggests that he represents the Technical Expert archetype:

> *I was very much accustomed with the warehouse and the POS. I became the key resource for these systems because I understood how to do reports and the inventory. I was able to master all the functionalities of those systems. (Warehouse clerk)*

The Campaigner archetype was embodied by various individual at Woolhouse. Each of these individuals were in charge or responsible of various sectors of the organization, e.g. design, distribution, production, boutiques, accounting. Even if they were not technology experts, they had a good understanding of the IT platforms used in the organization as well as the possibilities offered by the upcoming platform. Thus, since they were working in different organizational sectors, they use their social skills and knowledge to promote their preoccupations and interests regarding the new technology.

[1] Capturing and evaluating the cognitive knowledge, skills and attitudes of each respondent via semi structured interviews have been challenging. A more appropriate approach would have been to use an evaluation questionnaire. While we have been able to collect data related to the cognitive area in each of the three case studies, we have not been able to evaluate this area and thus, we left it blank in Figures 2, 3 and 4.

Family is family, so sometimes individuals are squabbling like any family, but it gives us even more the feeling of being part of the family. However, it allows clarifying things and helps having a better understanding of the organization. Honestly, everyone means great and like I said, we're really involved. (General Manager)

Finally, the Organizer archetype was embodied by the owner's daughter who had worked in the company for the past 10 years. She knew very well the products and organizational processes and was appointed, by his father (the owner), as the responsible for all the IT projects. Even though she did not possess technical knowledge before being appointed in charge of the IT projects, she invested a lot of energy in understanding the advantages of investing in new IT by reading, attending specialized conferences, and surrounding herself with knowledgeable individuals. Thus, she became the Woolhouse's technological 'hub' once she developed a good understanding of the organization's operations as well as the functionalities of the IT platforms.

She is the one most interested with IT ... she began to understand, to seek, to always push for us to be on the cutting edge of technology, ... She surrounded herself with a team of young people comfortable with IT. (Staff coordinator)

Based on the data collected, the Organizer archetype at Woolhouse seems to be characterized by social knowledge, skills and attitudes, but also by technological interest and understanding of the link between IT and organizational change. As identified in the case study, the Organizer played a convergence role at Woolhouse in terms of IT. Her operational, social, and technological competencies enabled her to build connections between various employees' IT needs and requirements. In addition, data analysis suggests that the knowledge, skills and attitude of the various employees were complementary to one another. This complementarity might explain why Woolhouse did well in terms of their CRM adoption and use.

Case study 3: Synthouse

The third case study was conduct in Synthouse, a 100 employee family-owned SME that operates in the hosiery and sock mills sector. More specifically, this SME specializes in high performance tights and competition apparel (e.g., dance and figure skating clothing). Synthouse has a large variety of diversified products which organization and is very flexible in terms of productions tasks. To develop such flexibility, the organization had to develop new competencies and to innovate in terms of production techniques. To maintain this flexibility and stay innovative, Synthouse had to develop and implement a new IT infrastructure as well as develop the DF of their employees. For this case study, five employees were interviewed.

Our data analysis suggests that at Synthouse the production/HR manager represents the main resource for knowledge and expertise regarding IT in the organization. He was also the one who understood the need for employee DF in the organization. Synthouse general manager had a more limited view and understanding of IT and approved IT investments based on their ease of use and performance, rather than on the organization's needs and strategy.

Based on our data analysis, two different DF archetypes seems to exist in this SME: the Technical Expert and the Campaigner. In this organization, the Campaigner archetype is strongly embodied by the general manager. However, compared to the campaigner archetypes identified at Castlehouse and Woolhouse, the campaigner at Synthouse seems to lack basic technical knowledge and skills. This lack of technological competencies makes it difficult for him to understand the current role played by the IT platform in the organization. Moreover, it is difficult for him to identify Synthouse's technological needs as well as adequately evaluate the strategic advantages offered by new IT solutions. This situation seemed to be problematic because Synthouse president/owner delegated most of the managerial responsibility to the general

manager who used his hierarchical position and his social relational skills to promote and justify the IT solutions which he considered as being the most suitable for the organization. For instance, at the time of the data collection, the general manager was stressing the importance of the development of a web-based e-commerce solution that would communicate with the existing IT platform. However, because of his lack of IT knowledge and skills, he did not understand the technological difficulties related to the integration of the web-based in the existing legacy-based environment (a mainframe-based technology).

> *He knows the organization well and he is well-intentioned. However, he does not seem to understand that the technological heart of the company, the AS400, is old and not flexible. (Sales/customer service manager)*

At Synthouse, the Technical Expert archetypes were embodied by the two managers, the production/HR and the sales/customer service, who were both directly reporting to the general manager. Both of these managers knew their employees very well and possessed the necessary skills to use the technology implemented in the organizational areas under their responsibility. Nevertheless, their understating was limited and they lacked the understanding of the general manager's intentions in terms of the web-based e-commerce project. They had not been informed or consulted regarding the project. In addition, the communication channels between the hierarchical levels as well as between the departments were deficient. Finally, the general manager mostly relied on the development of versatile employees, but this versatility did not take into consideration the DF its employees needed to evolve in a digital environment.

> *My team is open and ready. We want new technologies to be more efficient and up-to-date, but we have no idea what's coming and where we are heading. (Customer service manager).*

TAKEAWAYS

An organization's ability to be resourceful and capture the value-creating opportunities presented by the growth of IT and its usage is referred as IT innovation (Kim et al., 2016; Peltier et al., 2012). For SMEs, IT innovations are essential to ensure their competitiveness and survival. Thus, an SME that has a pool of employees with the adequate DF is more likely to technologically innovate as its employees are better at identifying IT affordances and the possible benefits of IT when compared with SMEs where DF are lacking (Caldeira & Ward, 2002). Our data analysis yielded four main takeaways:

Takeaway 1#: Digital Fluency Development and Training

Except for Castlehouse, the employees at both Woolhouse and Synthouse lacked a HR formal training structure to foster the regular and constant development of their employees' DF. The training offered in those SMEs usually concerned only the employees that already had technological backgrounds. In addition, vicarious learning and knowledge sharing between employees were not stimulated. Therefore, the cognitive and social domains were largely ignored during the development of the employees' DF.

Takeaway 2#: Diffusion of Digital Fluency

The SMEs studied here lacked formalized rules or approaches to transform the existing collaborative tensions, - the tensions that exists between digitally fluent employees and less digitally fluent employees -, in an opportunity to increase their employees' general DF. With the exception of Woolhouse, both Castlehouse and Synthhouse did not have any practice or mechanism to support knowledge transfer. In addition, most of the acquired knowledge during trainings was not documented and there was a lack of interest in creating an organizational memory that would support the documentation of the organizations' DF profiles.

Takeaway 3#: Management of the Cognitive and Social Domains

In all three SMEs, top managers rarely encouraged the appropriation of the information associated with the IT platform through the creations of operational manuals. We conjecture that this aspect might have been an obstacle to the reinforcement of technological, cognitive, and social innovation levels in the three SMEs. With the exception of Woolhouse, the managers of the other two SMEs did not recognize the importance of nurturing individual cognitive competences and collaboration initiatives (social competences) which usually constitute success factors in the process of creating innovative ideas.

Takeaway 4#: Socialize to be Digitally Fluent

In all of the three case studies, the collaborative dimension (social domain) of the DF was not sufficiently emphasized by the organizations. Our data analysis suggests that the collaborative level of the employees' DF was low for three reasons:

1. All three SMEs managed their departments/sectors in silos, thus preventing and limiting knowledge sharing and collaboration efforts between employees;
2. IT-driven changes in the SMEs were mainly influenced by the level of DF of the managers in charge of the IT initiatives;
3. Managers in charge of IT-driven changes lacked the communication skills, thus preventing the dissemination of the SMEs' IT vision and how the DF of employees' practices would be aligned with that vision.

CONCLUSION

Based on three case studies of IT implementation realized in three SMEs, our study suggests that the value that can be generated from IT investments is influenced by the SMEs capacities to develop their employees' digital fluency (DF) which encompasses complementary IT and non-IT knowledge, skills, and attitudes. The non-IT knowledge, skills and attitudes represents the "complementary assets" (Davern & Kauffman, 2000) that are required to transform IT investment into value and they allow organization to perform key activities exceptionally well without using IT, e.g. indigenous innovative skills, personal experiences, connections, commitment, openness of communication, and collaboration). Usually, these non-IT knowledge, skills, and attitudes will emerge in organizations that have adequate human resources (HR) capabilities and practices in terms of recruiting, developing competencies, motivating employees, and empowering them (Aral, Brynjolfsson, & Wu, 2012). Such capabilities and practices will enable organization to develop and maintain strong DF (Makadok, 2001).

Even if employees' DF represents key organizational capabilities, this concept still lacks clear conceptualization and standardization in both the IT and SME literatures. Practitioners and scholars alike need a clear conceptualization of DF to better understand and assess employees' DF. Recent studies suggest that SMEs that have employees with the appropriate DF will be better positioned to innovate from the investments made in new IT platforms and ultimately will be

better at adapting their IT strategies to the constant evolving digital economy (Cragg et al., 2013; Kim et al., 2016).

The main contribution of this study represents the proposed conceptualization (Figure 1) and definition of DF. The DF conceptualization draws on a set of learning areas, i.e. knowledge, skills and attitudes (i.e. including abilities, strategies, values and awareness) and on three complementary competence domains i.e. technological, social and cognitive. The competence domains, which are possessed by employees, are employed for performing tasks, solving problems, communicating, assessing information, managing data, collaborating with colleagues, sharing knowledge, and creating and/or building knowledge with IT platforms and tools.

The second contribution of this study stems from the three case studies that were used to develop a typology of employees' DF. In this typology, three different archetypes were identified: the technical expert, the campaigner and the organizer. Our data analysis results are aligned with Harison and Boonstra's (2009) observations who argued that developing efficient employees' DF will form organizational capabilities which should help successfully manage organizational change.

Shedding light on how and why multiple combinations of cognitive, social and technological knowledge, skills and attitudes may surface in different SMEs' contexts represents the third contribution. These various combinations, which are influenced by the different contextualized HR practices, correspond to different levels of organizational competitive performance, with the possibility that some them, though different in their compositions, would have similar impacts (equifinality). By generating similar results from different combinations, it is suggested that there would be no "best way" to combine different IT and non-IT knowledge, skills, and attitudes, and the successful outcome of these combinations would stem from more "aligned" combinations with the specific organizational objectives.

In terms of practical implications, we observed that it is practically impossible for a single employee to possess all the knowledge, skills, and attitude in all the three competence domains. However, more importantly for SMEs is to be able to evaluate the DF profiles of all their employees and identify the complementarities between these profiles. Thus, we posit that, to improve IT adoption and use, SMEs need to have individuals mastering learning areas in one or two of the three DF domains and at least one employee with an organizer profiles, i.e. an employee with some knowledge, skills, and attitudes that would reflect the organization's specific needs. This combination will eventually trigger the emergence of appropriate organizational DF and processes, which would facilitate effective adoption and successful use of IT.

Our study has limitations. One limitation is that we try to generalize only from empirical statements to theoretical statements from three case studies (Lee & Baskerville, 2003). However, it has been shown that statistical, sampling-based generalizability may be an unsuitable goal for qualitative studies (Yin, 2013). We suggest that the takeaways from our case studies in the Canadian clothing industry should be assessed in other contexts for further refinements that would eventually offer statistical generalizability. Looking at different industries may also provide new understandings.

CLASS QUESTIONS

1. What does it mean for an individual to be digitally fluent in the today digital economy?

2. Why is it important for an organization to know the level of the "digital fluency" of its employees?

3. Are large organizations' and PME's challenges the same in terms of the digital fluency of their employees? Justify your answer.

4. In your own words, what are the distinctions between knowledge, skills, and attitude?

5. What are the key characteristics of the proposed multidimensional conceptualization of digital fluency (DF) in Figure 1?

6. Why the change agent perspective is used as a theoretical lens to developed the DF archetypes of SMEs' employees? What are its advantages?

7. What are the fundamental elements or characteristics of each of the three DF archetypes (the technical expert, the organizer and the campaigner) described in Table 3?

8. What are the main similarities between DF archetypes identified in each of the three case studies? What are their main differences?

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